GENERAL DYNAMICS
Armament and Technical Products

Objective Crew Served Weapons (OCS

XM307 Program Reliability Growth, Ammunition Development and Advanced Technology Demonstration Tests

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XM307/XM312 Family of Weapons

- **XM307**
  - Lightweight 25 mm
  - 30x Lethality over Legacy Weapons
  - Application: Light Infantry, Vehicle, Aircraft

- **XM312**
  - Lightweight .50 Cal
  - 8x Lethality of M240 & M2
  - Application: Light Infantry, Vehicle, Aircraft

GENERAL DYNAMICS
Armament and Technical Products

XM307 SYSTEM

Fuze Setter Contacts

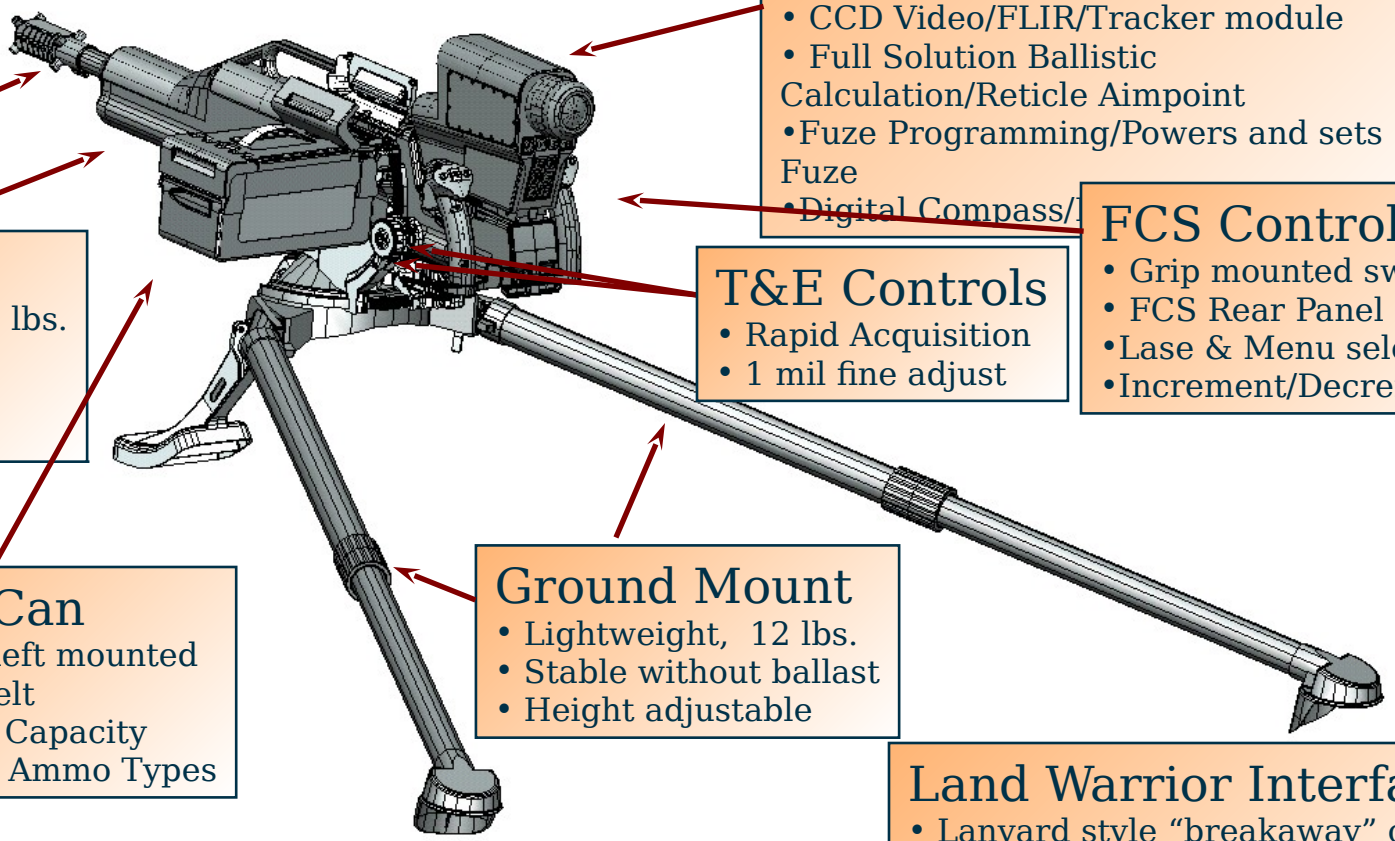
Fire Control System (FCS)
- Direct View Optics (DVO)
- Range Finder/CIDDS/MILES/Pointing Lasers
- CCD Video/FLIR/Tracker module
- Full Solution Ballistic Calculation/Reticle Aimpoint
- Fuze Programming/Powers and sets Fuze
- Digital Compass/

Muzzle Device
- Flash Suppression
- Inherently Reliable

Weapon
- Light Weight, 27 lbs.
- 25mm, 220 spm
- Soft Recoil
- Gas Operation

T&E Controls
- Rapid Acquisition
- 1 mil fine adjust

FCS Controls
- Grip mounted switches
- FCS Rear Panel switches
- Lase & Menu select
- Increment/Decrement



Ammo Can
- Right or left mounted
- Linked Belt
- 31 Round Capacity
- All OCSW Ammo Types

Ground Mount
- Lightweight, 12 lbs.
- Stable without ballast
- Height adjustable

Land Warrior Interface
- Lanyard style “breakaway” connecto
- Power, data and video over interface
- Compliant to LW requirements

Current XM307 Program

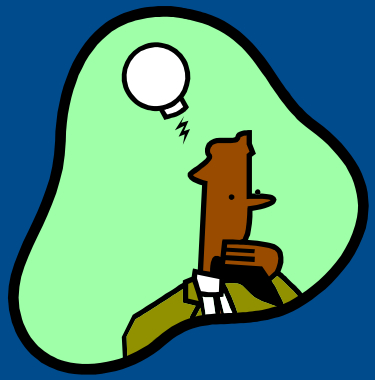
- XM307 Meets All ATD Exit Criteria
- Maturity TRL 6
- Demonstrated:
  - Full System Integration
  - Fire Control
  - Ammunition through System Integration Tests
- Progressing Weapon Maturity, Durability and Reliability through Program Outgrowth & Spin-off
- Application of XM307 to New Weapon Platforms (e.g. XUV)

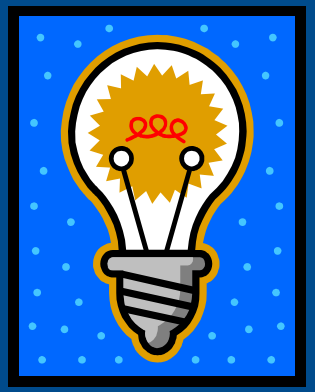
XM307 Reliability and Durability Growth

- **System Integration Tests (SIT) indicates Weapon Maturity, Reliability and Durability Progress**
- **MRBF Improvements**
- **Parts Durability**
- **SIT Demonstrated:**
  - Weapon/Fire Control Integration
  - Ballistic Algorithm
  - Accurate Ballistic Reticle
  - Reliable Fuze Setting in Full Auto

XM312 Outgrowth and Spin-off

- Necessity is the mother of invention
- How to mature the weapon reliability & durability at reduced cost to the program
- Baseline XM307 used .50 Cal impulse loads
- Utilize .50 Cal ammo to mature weapon and reduce required ammo unit costs
- XM307 .50 Cal variant becomes basis of new lightweight .50 Cal XM312 gun





Develop Gun Technology with Similar Impulse/Size Munitions

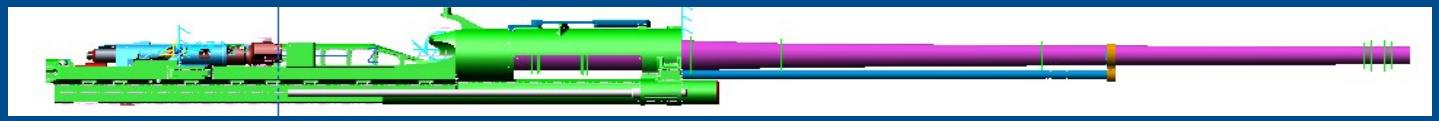
- XM307 Similarities .50 Cal
  - Cartridge Length 4.7 Vs 5.4
  - Similar Impulse 13.4 lb-sec Vs 12.0 lb-sec
  - Peak Bolt Face Load 24,000 lbs 22,000 lb
  - Requires 5 XM307 Parts to be modified all others remain the same
  - Barrel Length 25.11 Vs 33
  - Maintain 40 spm sustain rates
  - Requires the M15A2 side stripping link
- XM307 has demonstrated capable of impulse variation
- XM307 demonstrated feeding 5.1 inch rounds

XM307/XM312 Implementation Strategy

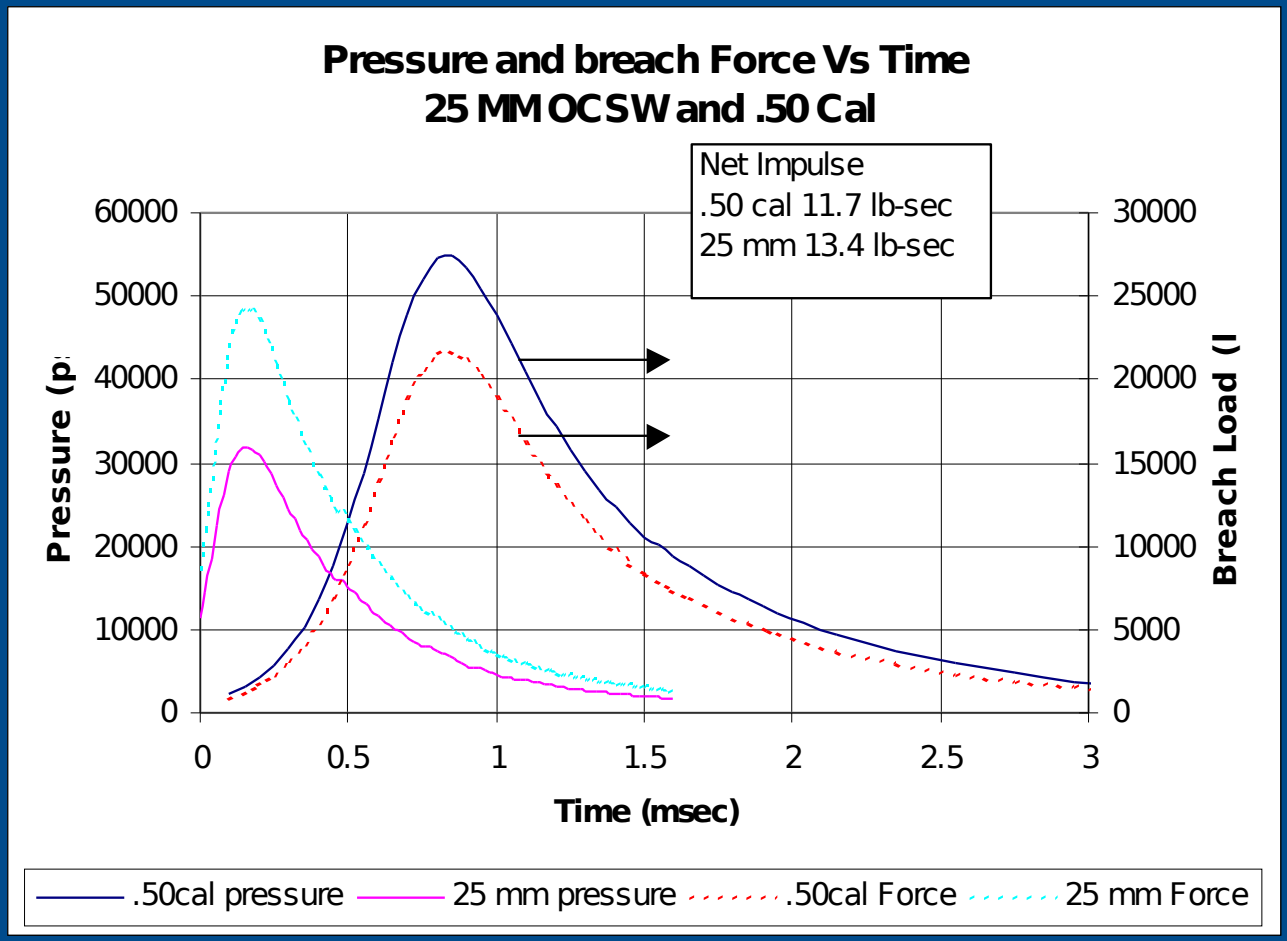
- **XM312 Reduces Overall Cost to XM307 Reliability Program**
- **Uses .50 Cal Ammunition to Increase Weapon Reliability**
  - All Parts (5) that Handle the Projectile were Modified
  - Same Impulse & Breech Loads
- **Reaching Higher Reliability Level for XM307 Program**
  - Family of Weapons in 25 mm and .50 Cal
  - 95% commonality in parts
- **Leverages the Accuracy and Light Weight Characteristics of the 25 mm Weapon to Provide a Highly Accurate Lightweight .50 Cal Weapon**

XM307 / XM312 (.50 CAL) Comparison

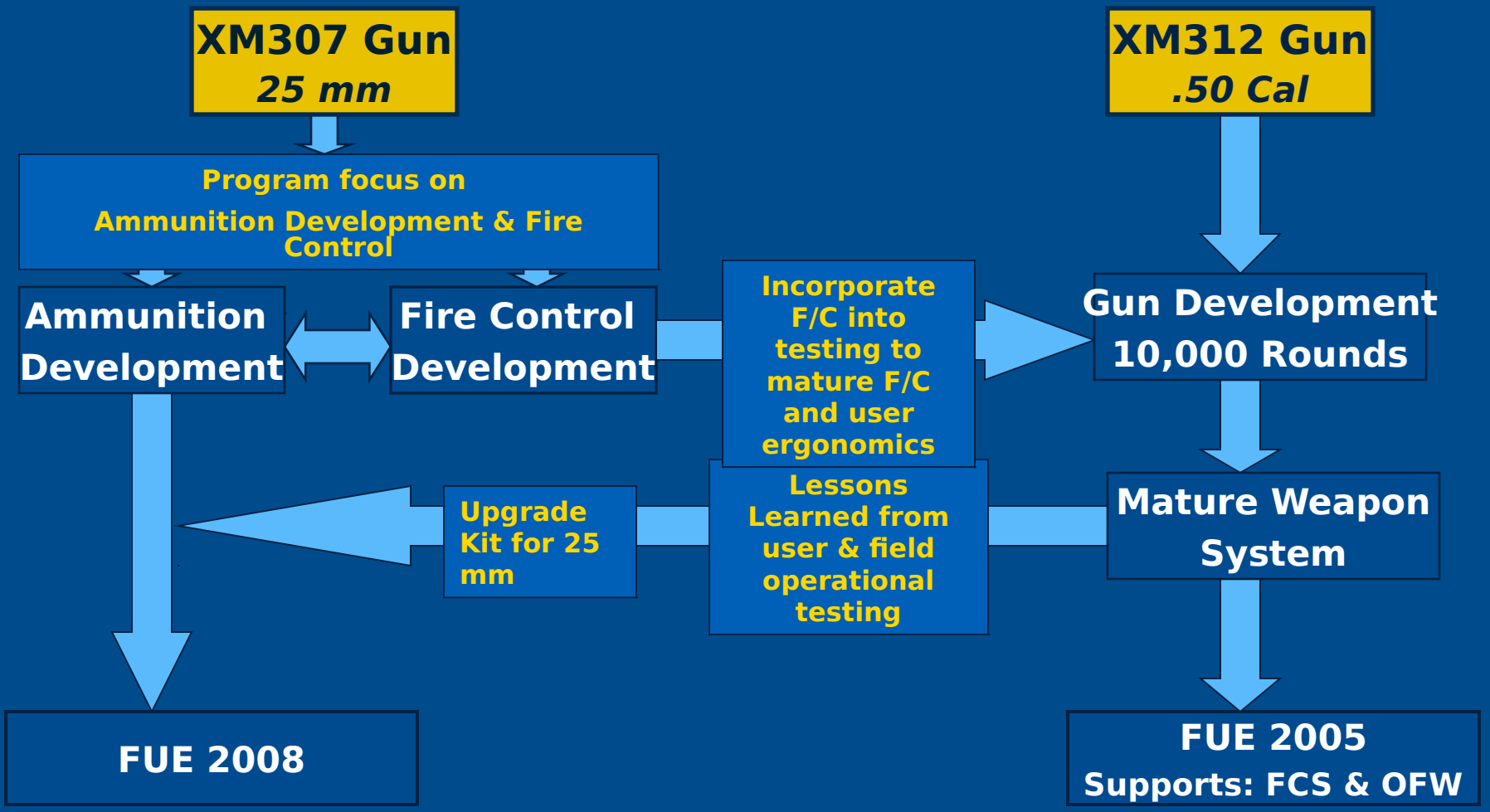
Feature	M2	XM307 (25mm)	XM312
Caliber	50	25mm	50
Weight (lbs)(Iron Sight)	84	28.5	30.0
Weight W/F/C	--	35.2	36.7
Sustained Rate of Fire	40	40	40
Recoil Force (lbs)	1000	250	150 - 250
Targeting (Full system)	>10 mils	<1.5 mil	<1.5 mil
Tripod	44 lbs	13 lbs	13 lbs



Pressure Profile Comparison



Reducing SDD Risk Road Map



Benefits to Mixed Caliber Family

- **Greater Lethality**
  - Greater Standoff Distance in Suppressive Fire
  - Better Armor Piercing Capabilities with .50 cal over M240
- **Reduced Support Cost due to 95% Commonality in Parts**
- **Reduced Time of Flight in .50 cal for Quicker Engagements**
- **Teaming Arrangement at the Squad Level**
  - .50 Cal to Quickly Suppressed Drive Target to Defiladed
  - 25 mm AB to Kill in Defiladed.
  - Increase Final Protective Fire Benefit

XM312 (.50 CAL) Status

- August: Presented .50 CAL concept to PEO Solider
- September: GDATP funded .50 CAL Proof of Principle IR project
- November: First .50 CAL firing.
- May 2003 500 rds fired on .50 cal M33 and Slap capable
- ***TODAY:***

- **Targeting: <1.2 mils**
- **Weight (w/ Iron Sight): 29.3 lbs**
- **Length: 53 Inches**
- **Sustained Rate of Fire:**
  40 rounds/minute (same as M2)
- **Cyclic Rate of Fire: 220-250 RPM**
- **Recoil Force): 150-250 lbs**
- **Muzzle Velocity: 2760 ft/sec (M33)**
- **Lightweight Tripod and innovative T&E**

DEPICT RESULTS OF
GD-ATP IR&D FUNDED PROJECT

XM307 to XM312 Conversion

Conversion to .50 cal less than 4 minutes

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Armament and Technical Products

XM312 Comparison to M2 HMG

9X More Accurate

XM312 <1.5 mil

M2 >10 mil

8X Rounds on Target Improvement

M2 & XM312 40 round susta
firing rate. (standard NATO
@ 1000M and one minute fir

66% Lighter Weight

XM312 43 lbs.

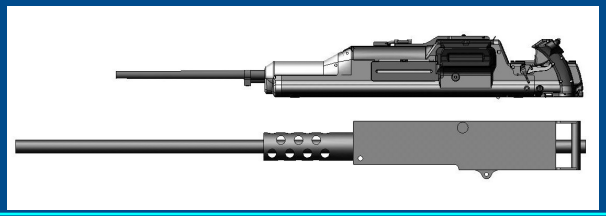
M2 128 lbs.

Fires Full Range of .50 CAL AMMO

12.7mm (.50 cal) M33 Ball
12.7mm (.50 cal) M20 APIT
12.7mm (.50 cal) M903 SLAP

XM312 capable of firing M2 qualified ammunition; Forward-stripping links required (M15A2)

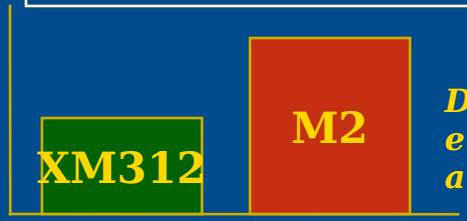
18% Shorter



XM312 (53")

M2 (65")

Point, Aim & Fire Time Cut In Half



Due to capabilities of adva
ergonomic T&E design
and operation!

GENERAL DYNAMICS
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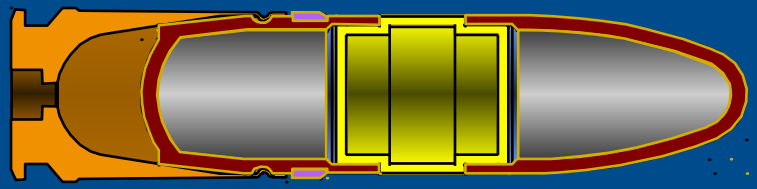
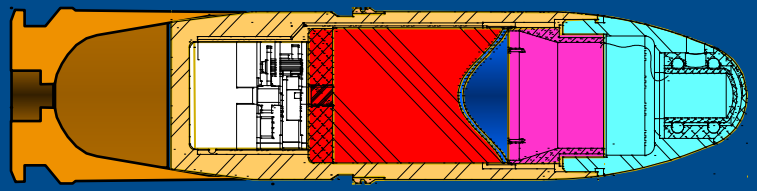
XM307 BALLISTICALLY MATCHED 25mm AMMUNITION FAMILY



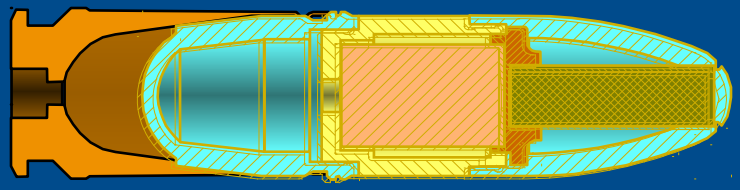
CARTRIDGE, 25 MILLIMETER, BURSTING, XM1019

- Prescored Steel Warhead
- LX-14 High Explosive
- Defeats PASGT Vest & Helmet



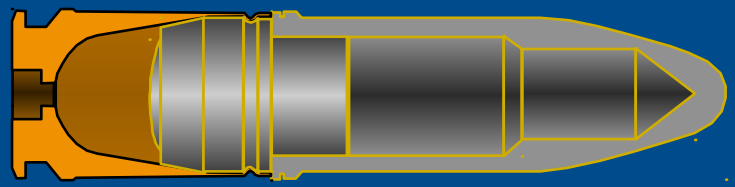
CARTRIDGE, 25 MILLIMETER: Armor Piercing, XM1049

- 51mm RHA (Threshold)
- 51mm HHA (Goal)



CARTRIDGE, 25 MILLIMETER: Target Practice - Spotter, XM1051

- Airburst Flash Bang Training



CARTRDIGE, 25 MILLIMETER: Target Practice, XM1050

- Two-Piece Projectile
- Integral Rotating Band

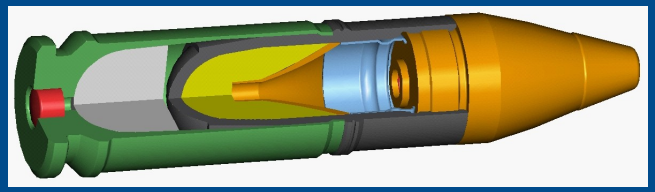
Footnote: CARTRIDGE, 25 MILLIMETER: Blank, XM1047 not shown.

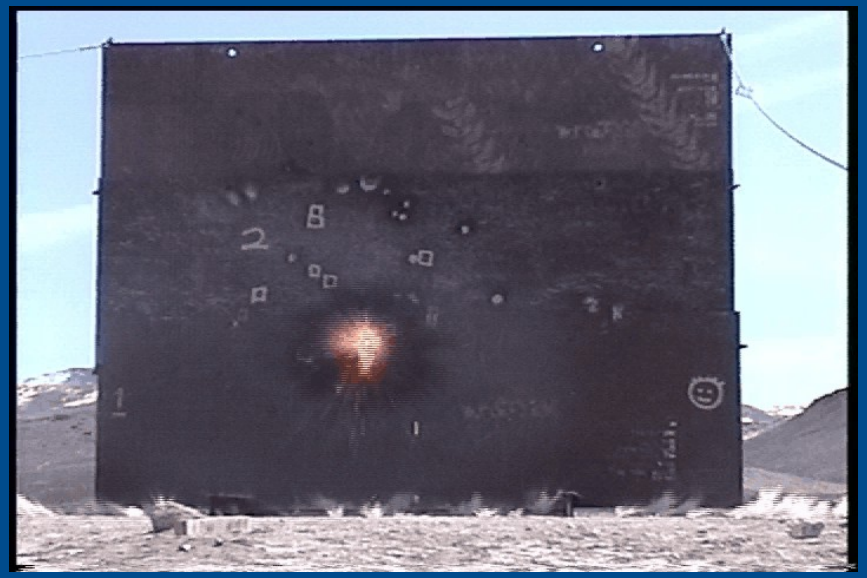
CARTRIDGE, 25 MILLIMETER: Target Practice (TP) XM1050

- 20,000 rounds built and fired to date
- Mann barrel dispersion ~0.25 mils @ 200yards
- System dispersion ~1.1 mils @ 1350 meters
- Simple two piece projectile construction
- Integral rotating band
- Common cartridge case, primer and propellant

CARTRIDGE, 25 MILLIMETER: Armor Piercing, XM1049

- Off the shelf nose fuze with spitback
- Advanced molybdenum shaped charge liner
- Over 2 inches of armor penetration (Lab)
- Flight tested to 963 Meters
- Dispersion ~ 0.75 mils



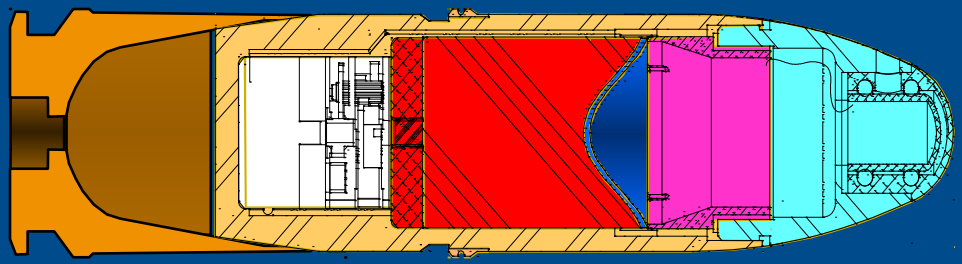


First Generation

CARTRIDGE, 25 MILLIMETER: Armor Piercing, XM1049

Improvements:

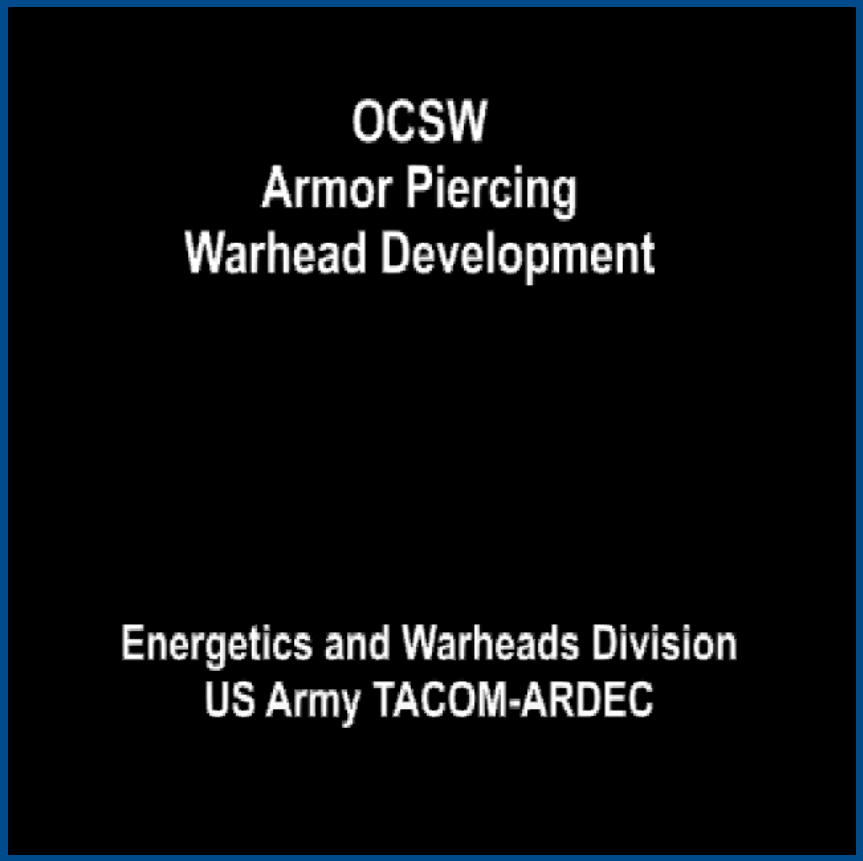
- Remove nose fuze = greater penetration
- Base fuze utilizes existing HE safe and arm
- Reduced parasitic weight
- Addition of self destruct feature
- Provides basis for high explosive dual purpose (HEDP) airbursting capability



Next Generation

Armor Piercing, XM1049 Advanced Development

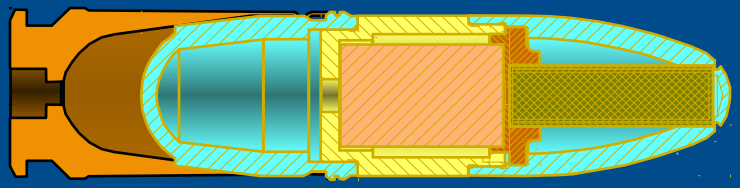
- Increased armor penetration through modeling and simulation of shaped charge liner
- Base fuze utilizes existing safe and arm for increased parts commonality, reduces cost
- Manufacturing technology (MANTECH) program for molybdenum liners
  - Optimized powder metal preform consolidation,
  - Net and near-net shape forging of liner contours using wrought and powder metallurgy processed materials
  - High rate finish machining techniques.
  - Reduced cost!



Simulation courtesy of Dr. Ernie Baker, TACOM-ARDEC

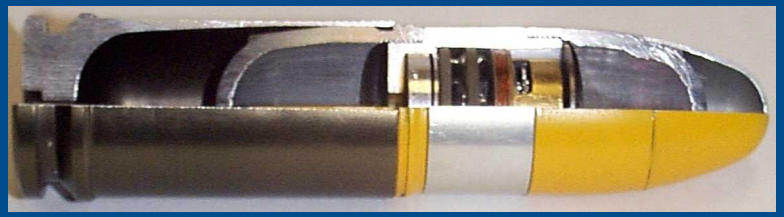
CARTRIDGE, 25 MILLIMETER: Target Practice - Spotter, XM1051

- Flash bang round
- Identical ballistics to XM1019 high explosive air-bursting round
- Increased safety during fuze and system development
- Reduces Fuze and Systems Integration Test costs
- Provides Realistic Training Without Fragmentation or Explosives Hazards
- 1000 rounds fabricated and tested to date



CARTRIDGE, 25 MILLIMETER, BURSTING, XM1019

- Remote settable high explosive air bursting ammuni
- Embossed warheads for fragmentation control
- Muzzle velocity correction reduces round to round air-burst range error
- Independent point detonating/self destruct switch
- Independent back-up power supply
- Solid state power supplies – no batteries
- Mechanical safe and arm for maximum safety



BLANK, CUP & DRAW (BCD) PROJECTILE FORMING PROCESS

4-STEP (MTO)

2-STEP FORMING ELIMINATES ALL INTERMEDIATE PROCESS ANNEALS AND ATTENDANT HANDLING

STREAMLINED 2-STEP (MANTECH)

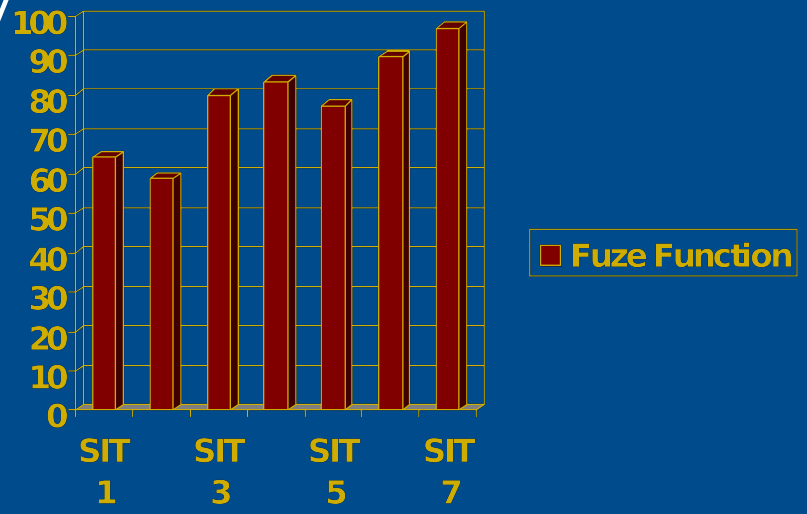
BCD YIELDS SUPERIOR CONTROLLED FRAGMENTATION IN AFFORDABLE HIGH VOLUME PRODUCTION PROCESS

System Integration Tests #1 - #5

- **Objectives**
  - **Overall System performance and integration**
    - **System performance determined by radar and high-speed video (HSV) data.**
  - **Target Acquisition System (TAS) performance and functionality**
    - **Menu operation and functionality**
    - **Durability during firing**
    - **Ability to program fuzes statically and dynamically (at firing rate)**
    - **Laser ranging and offset reticle accuracy**
    - **Proper ballistic solution algorithm (BSA) input and output**
  - **Weapon performance and functionality**
    - **Reliability/Durability**
    - **Weapon dispersion and cyclic rate**
  - **Precision Air-Burst (PAB) of the TP-S (spotter) out to 2KM**
    - **Trajectory of the TP, and TP-S out to 2KM**
    - **Time of Flight (TOF)**
    - **Airburst Spatial position of TP-S projectile**
    - **TP-S and TP Dispersion**

System Integration Tests #1 - #5 Results

- Refinement of muzzle correction algorithms
- Improving weapon reliability
- Integration of fire control
- Improvement of ballistic algorithms
- Improved safe and arm reliability
- Reliable airburst function
- Accurate airburst function
- Explosive train reliability



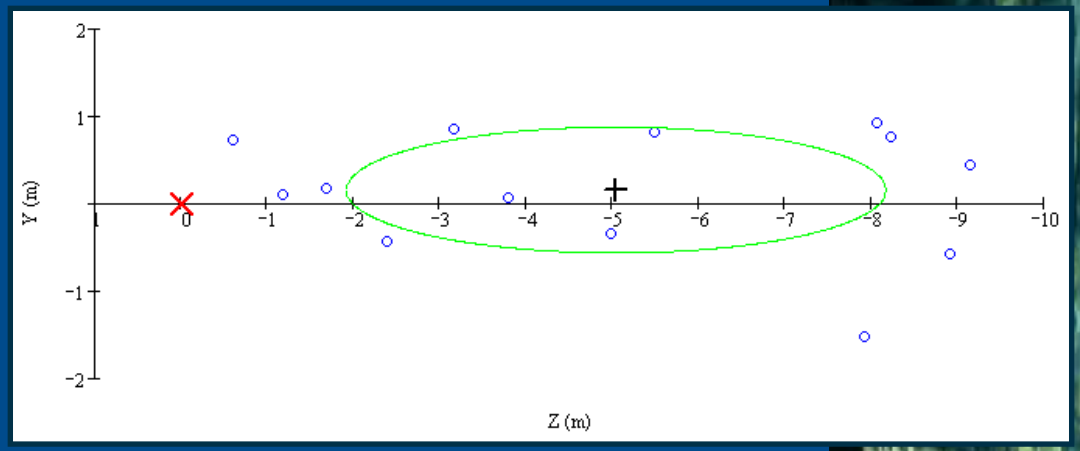
ATD OCSW Test Results
System Integration Test #6

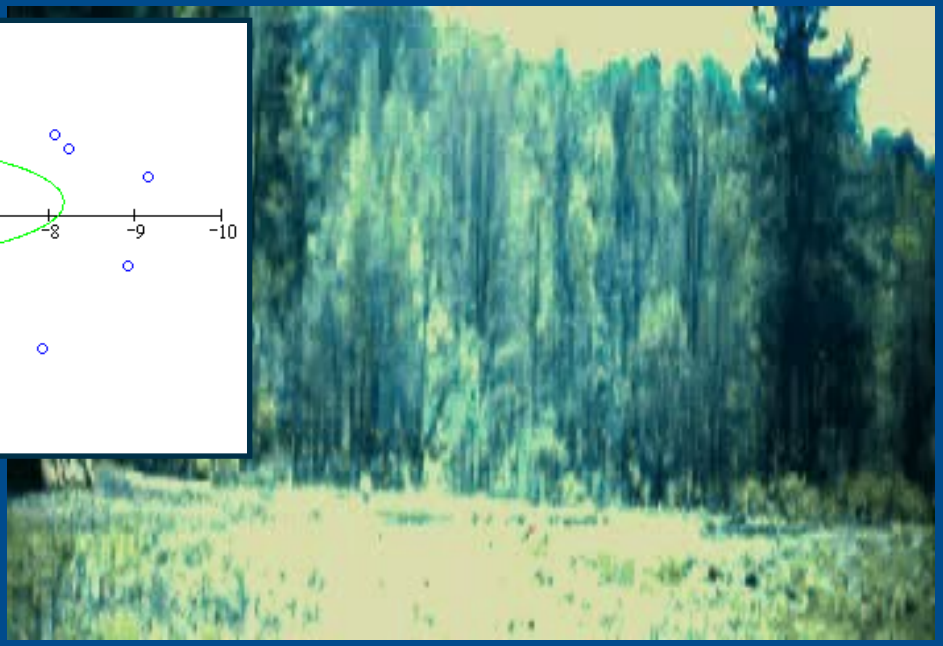
- Measured ATD Exit Criteria:

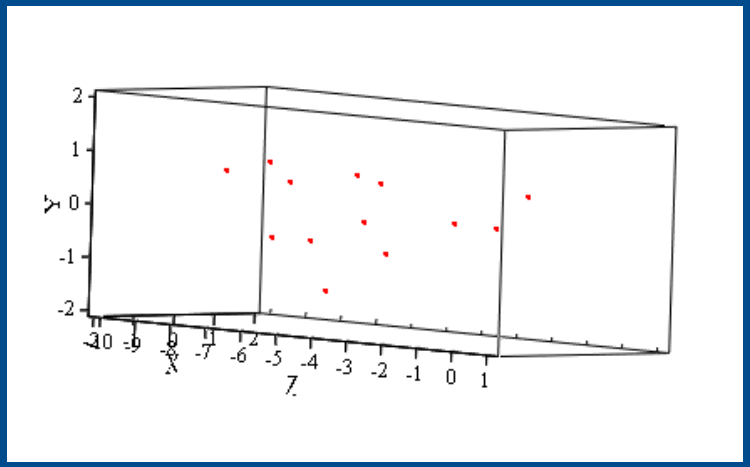
Criteria	Threshold	Measurement
System Weight	57 lbs	48.4 lbs ✔
Crew Portable Module	38 lbs	36.1 lbs ✔
Accuracy / Dispersion TP-S	2 mils	0.20/1.54 Avg - mils ✔
HEAB Inert		1.30/0.90 Avg - mils ✔
Fuze Function Set by Fire Control bursts	Single Shot	3 rounds ✔
Air Burst Point Range Error	+/-5 m	-5.0 m ✔
Probability of Hit, Vehicle Target	35%	100% (3 events) ✔

- Weapon fired all 139 test rounds with no failures or stoppages ✔
- Fuze success rate – 96% ✔
- **Satisfied All Measured ATD Exit Criteria**

ATD OCSW Test Results
System Integration Test #6







Burst Point Accuracy Test	X	Y	Z
Aim Point (mil)	0.00	0.00	0.00
System MPI(m)	-0.09	0.15	-5.04
System Accuracy (mil)	-0.15	0.25	N/A
System Dispersion(m)	1.13	0.72	3.13
System Dispersion (mil)	1.88	1.20	N/A

SI Test #7 Overall Results

- Satisfied All Measured ATD Exit Criteria
- Measured ATD Exit Criteria
  - **Criteria** | **Threshold** | **Measurement**
    - **Fuze Function Set by Fire Control** | **Single Shot** | **3 round bursts**
    - **Air Burst Point Range Error** | **+/-5 m** | **+2.2 m**
    - **Probability of Hit, Vehicle Target** | **35%** | **100% (3 events)**
- System fired all 128 test rounds with no failures or stoppages.
- Airburst function reliability – 50 / 50

28-Aug-02	Burst Point Accuracy Test	X	Y	Z	TP-S
	System MPI(m)	0.15	1.22	2.22	
	System Accuracy (mil)	0.24	1.91	N/A	
	System Dispersion(m)	0.46	1.22	2.32	
	System Dispersion (mil)	0.71	1.90	N/A	

Summary

- The Objective Crew Served Weapon (XM307) has met all of its ATD thresholds and very close to its objectives
- A final Exit Criteria test will be held in July to validate XM307 performance.
- The XM307 is ready for System Development and Demonstration (SDD).